

Appendix B
California Coastal Commission LNG Siting Studies
(Summary)

California Coastal Commission
**Final Report Evaluating and
Ranking LNG Terminal Sites**

May 24, 1978

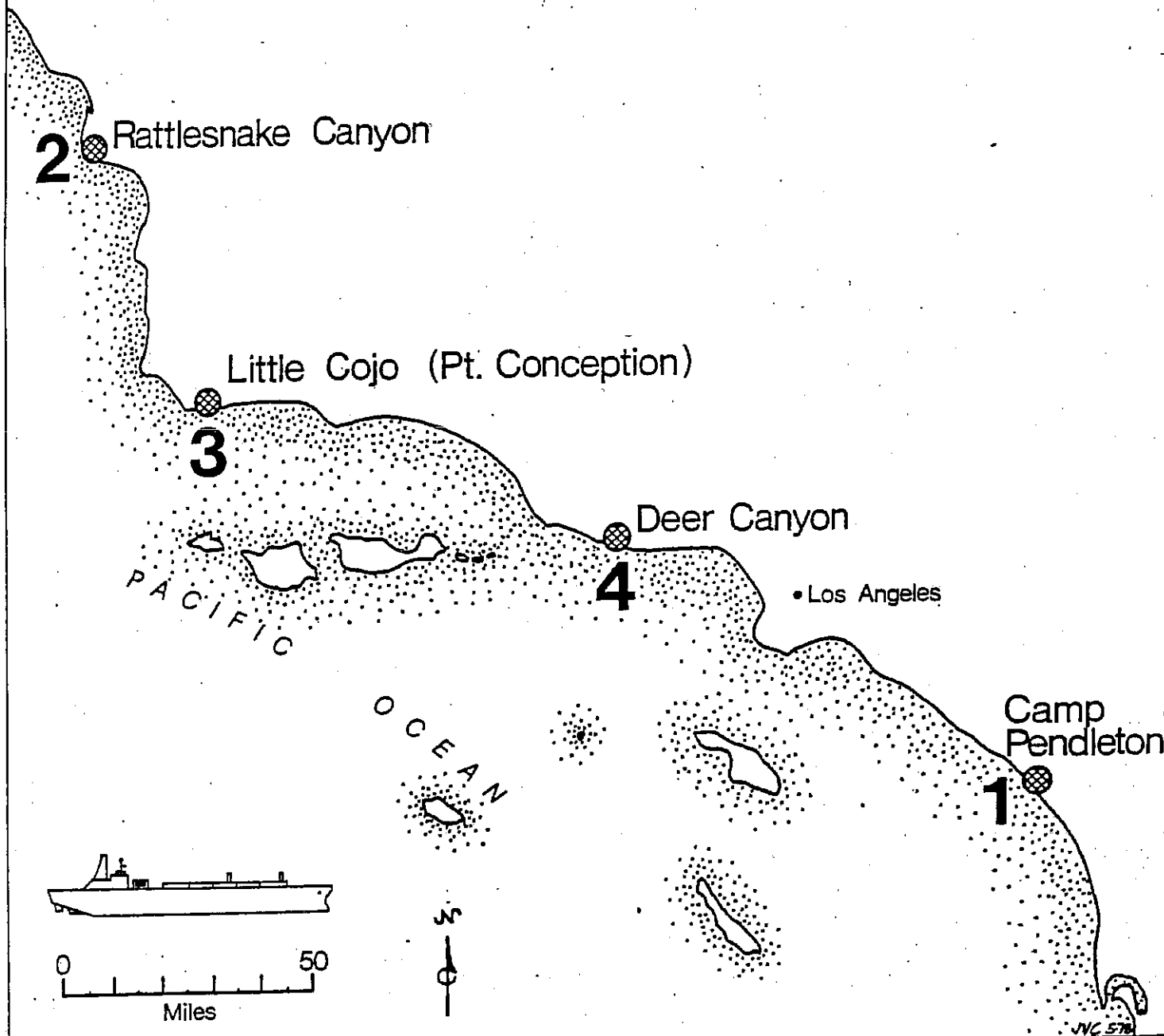


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FINAL REPORT EVALUATING AND RANKING LNG TERMINAL SITES

SUMMARY

On May 24, 1978, the California Coastal Commission adopted the following ranking of potential LNG terminal sites:

1. HORNO CANYON on Camp Pendleton in San Diego County where a terminal would have the least adverse impacts on coastal resources.
2. RATTLESNAKE CANYON in San Luis Obispo County.
3. LITTLE COJO near Point Conception in Santa Barbara County.
4. DEER CANYON in Ventura County where a terminal would have the most overall adverse impact on coastal resources.

The Commission eliminated a fifth site, at LAS VARAS in Santa Barbara County (Figure 1), due to the recently confirmed presence of a small active earthquake fault passing through the site. A similar fault has been identified at the LITTLE COJO site, which is nevertheless retained in the ranking because the LNG Terminal Act of 1977 requires that the Commission rank the site selected by Western LNG Terminal Associates in its application to the Public Utilities Commission (PUC).

The Commission also adopted thirty-one terms and conditions designed to minimize adverse LNG terminal impacts, at any of the sites, on recreation, natural resources, public views and other resources protected by the policies of the California Coastal Act of 1976. The Commission is required to submit a site ranking with recommended conditions to the PUC by May 31, 1978. The PUC must then reach a decision on whether a permit should be granted for construction and operation of an LNG terminal at one of the sites by July 31, 1978.

It has been difficult to identify possible onshore LNG terminal sites on the 1,100 mile long California coast. The Commission evaluated 82 possible sites, including 18 nominated by the public, and retained only five as potentially feasible sites for further study and ranking. Adverse wind, wave and fog conditions, nearby urban areas, earthquake faults and rugged land ruled out most of the coast for siting potentially hazardous LNG terminal operations. Seismic evaluations of the five sites resulted in discovering small active surface faults at two of them, and such faults may be found at the other sites after additional evaluation.

LNG Terminal Sites Retained for Final Ranking

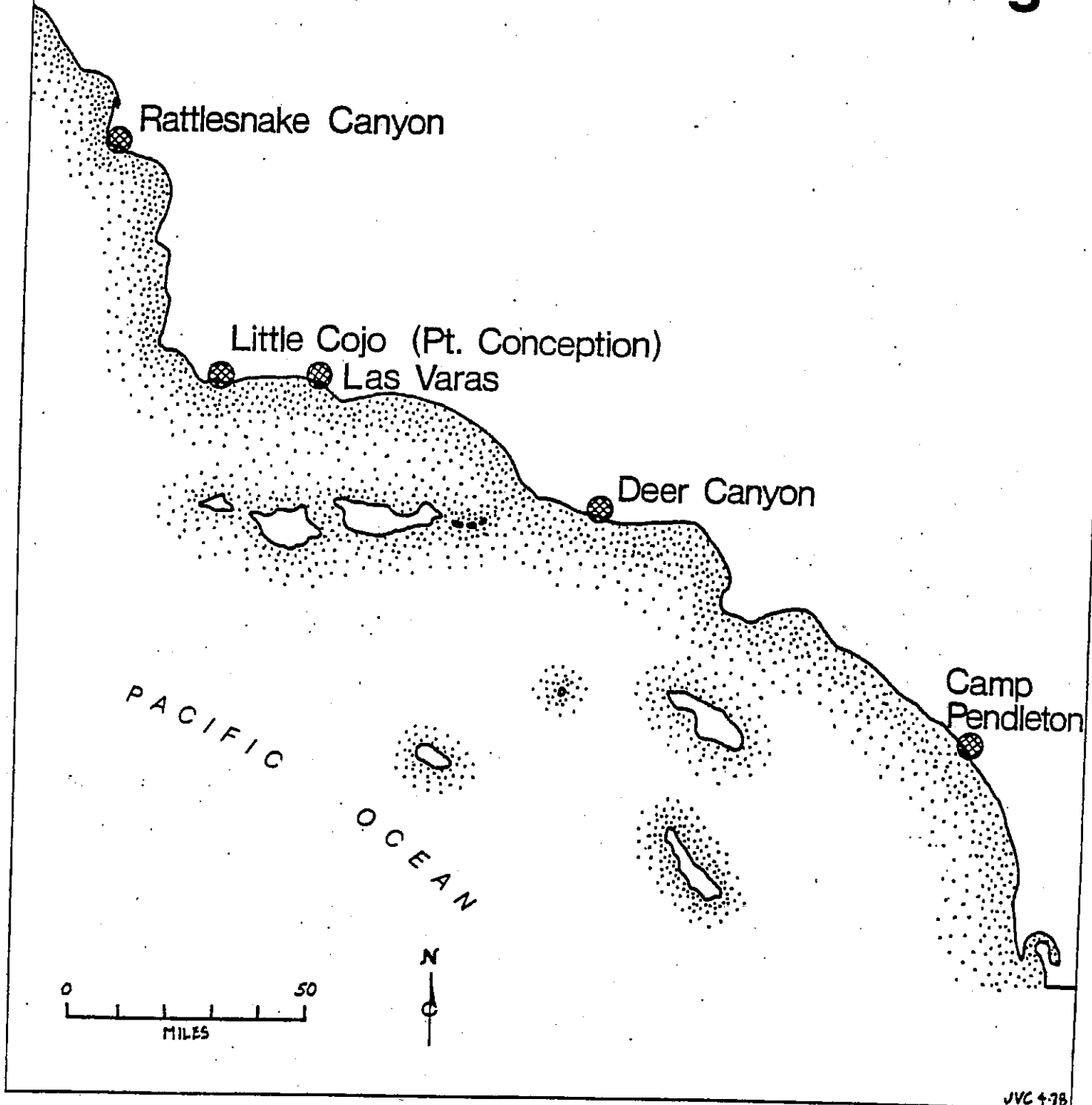


Figure 1

The Commission contracted with a number of consultants to assist in technical evaluations of the sites, and correspondence has been received on the site ranking from many federal and state agencies, environmental groups, surfers, property owners, Western LNG Terminal Associates and other interested parties. The Commission held four public hearings in April near the sites to be ranked and received testimony from more than 150 groups and individuals. A final public hearing on this report was held in Los Angeles on May 15, 1978. The process established by the LNG Terminal Act for identifying, evaluating, and ranking sites by the Coastal Commission has been an open public process. The record contains over 2000 letters and reports commenting on all aspects of the site ranking process.

I. BACKGROUND

A. The Liquefied Natural Gas Terminal Act of 1977

Site Ranking. The Liquefied Natural Gas (LNG) Terminal Act of 1977 (SB 1081) requires the Coastal Commission to identify, evaluate, and rank remote onshore sites for a liquefied natural gas terminal and to submit a final site ranking to the Public Utilities Commission (PUC) by May 31, 1978. Section 5613 (a) states in part:

"In ranking potential LNG terminal sites . . . the Coastal Commission shall base its ranking on an evaluation of the relative merit of each site and shall make findings, applying the policies, goals, and objectives of Chapter 3 (of the California Coastal Act of 1976)."

Western LNG Terminal Associates, a joint partnership of Pacific Gas and Electric Company and the Pacific Lighting Corporation, has applied to the PUC for approval to transport LNG to California and for a permit to construct and operate an LNG receiving terminal at Little Cojo (Point Conception) in Santa Barbara County. The LNG Terminal Act requires the Coastal Commission to include this site, selected by Western LNG Associates, in its ranking. The PUC, which has the sole state authority to approve an LNG terminal under the Act, must make a final decision on the application by July 31, 1978. Section 5631 (b) of the Act provides:

"If the commission (PUC) issues a permit, the commission (PUC) shall issue a permit for construction and operation at the site designated as the highest ranked site pursuant to Section 5612 (by the Coastal Commission). However, the commission (PUC) may select a lower ranked site if it has determined with respect to each higher ranked site that it is not feasible to complete construction and commence operations of the terminal at such higher ranked site in sufficient time to prevent significant curtailment of high priority requirements for natural gas and that approval of the lower ranked site will significantly reduce such curtailment."

Conditions. The Coastal Commission must also recommend terms and conditions to ensure that the construction and operation of a terminal at any of the ranked sites would be in accordance with the Chapter 3 Coastal Act policies. The PUC is required by the LNG Terminal Act to impose the Coastal Commission's conditions unless a condition would delay terminal operation long enough to result in significant curtailment of high priority natural gas requirements, would adversely affect public health or safety, or was not based on substantial evidence.

Population Limits. The LNG Terminal Act requires that an LNG terminal authorized under the Act be located at a remote onshore site on the mainland coast. Because of the Legislature's concern about the safety of liquefied natural gas, the Act limits the numbers of permanent residents and workers near an approved LNG terminal. Section 5582 contains the following population requirements:

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- "1. Population density shall be not greater than an average of 10 persons per square mile for a distance of one mile outside the perimeter of the site on which the offloading, regasification, and storage facilities for LNG will be located.
2. Population density shall be not greater than an average of 60 persons per square mile for a distance of four miles outside the perimeter of the site on which the offloading, regasification, and storage facilities for LNG will be located."

These density requirements mean that no more than about 27 permanent residents or workers could be within a mile of the proposed terminal and no more than about 1800 within four miles. In addition, the Act requires that the terminal be located so that LNG tankers would not pass closer to areas of population density greater than those given above.

The Act authorizes the use of eminent domain powers by the applicants to create and maintain the low population density. Local and state agencies are required to maintain the low population density around an approved site.

B. Project Description as Proposed by Western LNG Terminal Associates

Purpose of the Project. On October 14, 1977, Western LNG Terminal Associates filed with the PUC an application for a terminal at Little Cojo. The proposed marine terminal would receive LNG transported by ships, unload and transfer the LNG into storage tanks, regasify it, and deliver natural gas into transmission pipelines. Approximately 193 LNG tanker arrivals a year from Indonesia and South Alaska are expected at the terminal.

Terminal Configuration. The LNG terminal will consist of an offshore dock connected by a trestle to onshore storage and gasification facilities (Figure 2).

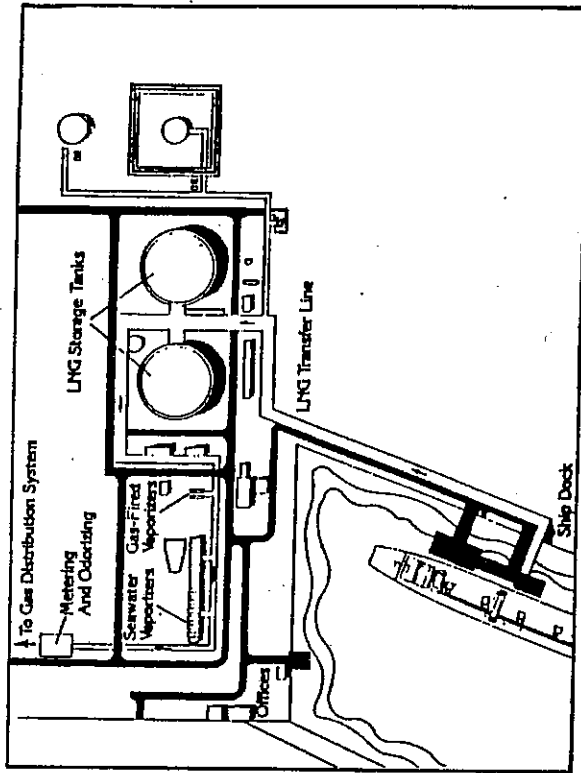
The applicant estimates an operating staff of 75 persons for continuous operation. Each of the steps in the process of receiving, storing, and gasifying the LNG received at the proposed site is summarized below.

Marine Facilities. A berthing facility to handle one LNG vessel and support tug and line boats will be located at the end of a trestle in 50 feet of water. The trestle will carry a service roadway and necessary pipelines. The berthing facility, with a concrete deck approximately 40 feet above mean low low water, will consist of an unloading platform, a service platform, and a control tower.

The following pipelines will link the berthing facility, via the trestle, to onshore facilities:

- 32-inch diameter insulated cryogenic (very low temperature) pipeline for transfer of LNG to storage tanks

Typical LNG Receiving Terminals



Everett, Massachusetts



Nikiski, Alaska

Figure 2

- 10-inch diameter gas vapor return line from the tanks to ships
- pipeline for Bunker C fuel oil
- pipeline for diesel fuel
- pipeline for potable water

A small boat dock and mooring buoys will be located alongside the eastern side of the trestle to service three tugboats and one work boat. Buoys will also be available for use by line handling boats and by small craft as refuge in bad weather.

LNG Unloading. The LNG will be transferred from the berthing dock to onshore storage tanks in a 32-inch diameter insulated cryogenic pipeline attached to the trestle. Three tanks, each with a 550,000 barrel capacity, will store the LNG at its normal liquefied temperature of -260°F. Each tank, 240 feet in diameter and 145 feet high, will be built inside an earthen basin or concrete dike which could contain more than 100 percent of the tank capacity in the event of a leak.

LNG Gasification (Vaporization). Before entering the natural gas transmission system for distribution, the LNG must be gasified by raising its temperature to between 50°F and 75°F. Under full operation, 1.3 billion cubic feet per day (BCFD) of natural gas will be vaporized. The LNG is pumped from the storage tanks and revaporized in a heat exchange chamber using seawater as the heat source.

Seawater System. Seawater to vaporize the LNG is pumped from the ocean at a rate of about 160,000 gallons per minute. After warming the LNG, the seawater is returned to the sea by pipe at an approximate temperature 12°F less than at intake.

The 9-foot diameter intake will be located offshore in 30 feet of water. The 8-foot diameter outfall pipeline will extend further to 50 feet of water to prevent the cold discharge water from entering the intake. Both lines will be buried by at least three feet of cover on the ocean bottom, except through the surf zone, where six feet of cover will be used. Trenching, dredging, and possibly blasting will be required for construction. To prevent marine growth in the seawater system, chlorine will be injected and later converted with sulfur dioxide to a chloride before being discharged in the outfall pipe.

Bunker C Fuel Oil. Bunker fuel oil for LNG vessels will be brought to the site by tanker ship or barge and will be pumped through a bunker oil pipeline on the trestle to an onshore storage tank with a 100,000 barrel capacity. Bunkering will be accomplished by first rigging an oil spill containment boom around the LNG vessel and then pumping the oil from the onshore tank.

Electric Power. Electric power will be supplied by constructing transmission lines to the nearest adequate substation. Two standby gas turbines and batteries will provide emergency power when necessary.

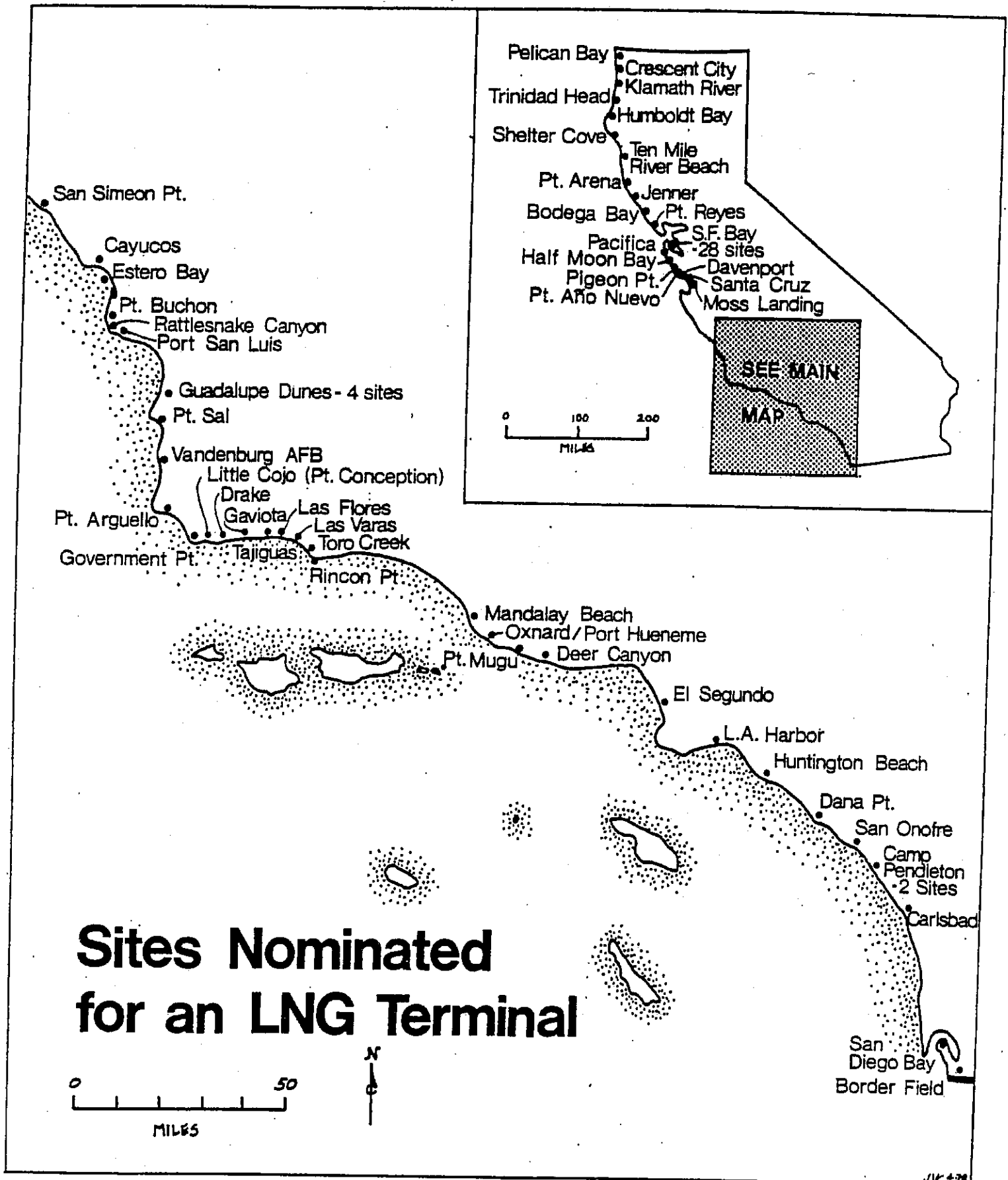


Figure 3

Diesel Fuel. Diesel fuel for LNG vessels, tugs, launches, and emergency equipment will be transported to the site and stored in a 5,000-barrel onshore tank.

Water. Water will be provided from ground wells and the ocean. A pipeline on the trestle will provide potable water to the service platform. Plant water, to be stored in a 5,000 barrel tank, will come from wells. Fire control water will be pumped both from ground wells and the ocean and distributed throughout the plant.

Nitrogen. Nitrogen for purging the vessels' tanks and unloading arms of all LNG after unloading will be produced by an onsite air separation plant and delivered to a storage tank on the unloading dock by truck.

Sanitary Sewage. The facility will include a waste treatment unit. Treated effluent will be discharged in the seawater return system.

C. Previous Commission Actions

In October 1977 the Commission directed the staff to begin identifying and evaluating possible terminal sites. Letters were sent to hundreds of interested parties requesting nominations of mainland onshore sites to be evaluated, and 18 sites were nominated by the December 1, 1977 deadline. The staff used other LNG and oil terminal siting studies, topographic maps, and area visits to identify 64 additional sites for preliminary evaluation (Figure 3).

Project management and support was provided by the consulting firm of Rust and Weinstein of San Francisco. Pat Weinstein managed the study.

The Commission contracted with a number of consultants to evaluate whether an LNG terminal could be constructed and reliably operated at the sites being considered by the Commission and to evaluate potential terminal impacts at the sites. The major consultants include: John J. McMullen Associates evaluating site maritime factors including wind and wave conditions and navigational hazards; Woodward-Clyde Consultants for geotechnical site evaluations; H. J. Degenkolb and Associates for structural engineering analysis; the California Department of Fish and Game for identification of marine and terrestrial plant and wildlife resources; Madrone Associates for analysis of terminal impacts on natural resources; and the Army Corps of Engineers Waterways Experiment Station for wave calculations for the sites.

To determine which sites could legally be retained as feasible for the site ranking, the 82 sites were evaluated on the following criteria: population density, land and water site characteristics, maritime conditions, seismic safety, and coastal resources. A large number of the 82 sites failed to meet the strict population density requirements of the LNG Terminal Act. Other sites were too near earthquake faults, the soil conditions were not suitable for constructing an LNG terminal, or adverse wind and wave conditions would prevent safe berthing of LNG tankers too many days during the year. Given the rugged character and adverse wind, wave, and fog conditions on the northern California coast, the urban areas on the southern California coast, and the dense criss-crossing of major and minor earthquake faults in the coastal area, it was difficult to identify potentially feasible sites for an LNG terminal.

After public comments and a staff workshop on the evaluation criteria, the Commission held a public hearing and voted, on January 31, 1978, to retain 5 of the 82 sites for further study and ranking (Figure 1). The Commission's consultants then evaluated these five sites in detail to determine whether engineering and maritime factors were suitable, while additional information and opinions on the sites were submitted by local, state, and federal agencies, property owners, Western LNG Terminal Associates, the military, and other interested parties. These submissions, the consultants' reports, major correspondence and the staff reports are listed in Section VI, Substantive File Documents, and all documents are in the official Commission record on this project.

As required by the LNG Terminal Act, the Commission held public hearings on the site ranking in April 1978 in San Luis Obispo, Santa Barbara, the City of Port Hueneme, and Oceanside. These hearings followed staff public workshops in the four areas at which interested parties provided information and discussed the site ranking process.

The staff work on this project was done by Tom Tobin, John Grattan, Bill Johnson, Suzanne Rogalin, Jody Loeffler, Chris Garland, Donna Gara, and Jonathan Van Coops, under the direction of Energy Coordinator William Ahern.

II. TERMINAL SITE RANKING AND FINDINGS

A. Site Ranking

The Coastal Commission adopts the following ranking for possible LNG terminal sites. The sites are ranked in order, starting with the site where LNG terminal construction and operation would have the least adverse impacts on resources protected by the policies of the California Coastal Act of 1976 and ending with the site having the most adverse impacts:

1. HORNO CANYON on Camp Pendleton in San Diego County
2. RATTLESNAKE CANYON in San Luis Obispo County
3. LITTLE COJO near Point Conception in Santa Barbara County
4. DEER CANYON in Ventura County

The Commission removes the LAS VARAS site in Santa Barbara County from the ranking due to the recently confirmed presence of a small but active earthquake fault on the site. A similar fault has been detected on the LITTLE COJO site, and the Public Utilities Commission and federal Department of Energy may not be able to approve this site given this seismic problem. However, because this site was selected by the applicant Western LNG Terminal Associates and must be ranked by the Commission, it is retained in the ranking, recognizing that it too may be eliminated from the ranking by the PUC or Department of Energy.

B. Findings on Site Rankings

The Commission adopts the following findings and declarations:

1. The Coastal Commission Has a Limited Role in the LNG Project Decision. The LNG Terminal Act of 1977 deleted the Coastal Commission's permit authority over the construction and operation of California's first LNG terminal. Under the California Coastal Act of 1976, the Coastal Commission had the authority to approve or deny an application for an LNG terminal on the California coast. The LNG Terminal Act replaced the Commission's permitting authority with a more limited role, to determine by ranking, which possible LNG terminal sites would have the least adverse impacts on the objectives of the Coastal Act and to submit that ranking to the Public Utilities Commission (PUC). That Commission has the exclusive state authority to make the decision on whether to approve an LNG project, based on overall consideration of the public health, safety, and welfare. The LNG Terminal Act does not allow the Coastal Commission to make a finding that an LNG terminal is not needed or adversely affects public welfare and therefore should not be permitted.

The Commission recognizes that the project has national energy policy implications, and that the level of gas supply affects the State's

economy and environment. In reaching its final decision on the location of an LNG terminal, the PUC is the State agency which will weigh these other factors, and will represent the State of California in the federal proceedings on this project.

2. An LNG Terminal at Any Site Will Cause Serious Impacts to Coastal Resources. The Commission finds that after an evaluation of 82 potential LNG terminal sites along the 1,100 mile long California coast and after intensive evaluations of five of those sites, there is no possible remote onshore terminal site that would not cause major adverse impacts to natural marine and wildlife resources, public recreation areas, and other resources protected by the California Coastal Act of 1976. Conditions imposed on the construction and operation of a terminal at each site would help reduce, but will not eliminate, these adverse impacts. The marine environment in these remote coastal areas will be disturbed by massive construction activities, including trenching, blasting, and pile driving. Regular LNG tanker maneuverings, fuel oil deliveries, and tug and line boat activity will continuously intrude noise and activity into areas used by sea birds and mammals, including the California grey whales. Onshore, because all sites are remote and relatively undisturbed, an LNG terminal will alter the character of the area and disturb valuable wildlife populations. The Commission urges the Public Utilities Commission to give these adverse impacts heavy weight in its decision whether to approve the proposed LNG project.

3. The Safety of LNG Operations Remains Uncertain. Section 5552 of the LNG Terminal Act of 1977 states in part:

"The Legislature further finds and declares that current uncertainties about the safety of liquefied natural gas require that the single terminal authorized by this chapter be located at a site remote from human population in order to provide the maximum possible protection to the public against the possibility of accident."

To implement this policy, the Act limits the population density within one and four miles of a terminal authorized under the Act. To further minimize risks from LNG terminal operations, the Act also requires the Public Utilities Commission to adopt regulations governing the safety and construction of an LNG terminal and to consult with the Division of Industrial Safety and the Energy Commission. At the federal level, the Department of Energy requires an LNG terminal operator to submit and receive approval of a Final Safety Analysis Report prior to operation of the terminal, and safety requirements of the U.S. Coast Guard, the Office of Pipeline Safety Operations, the Occupational Health and Safety Administration, and other federal agencies must also be met.

The Commission therefore finds that the major state consideration of the safety factors in LNG terminal siting, design, and operation has been addressed in the legislation and assigned to the PUC. Since the safety of LNG terminal and tanker operations is not within the Commission's legislative jurisdiction, only limited study was made of these safety issues and the possible consequences of LNG accidents to people, property and natural resources. However, the Commission has serious concerns about the adequacy of measures to prevent and to cope with LNG accidents and about the research undertaken so far to predict the consequences of LNG spills, fires, and vapor cloud dispersion (see Staff Notes). The Commission recognizes a decision on transporting LNG to California cannot wait until the completion of long term

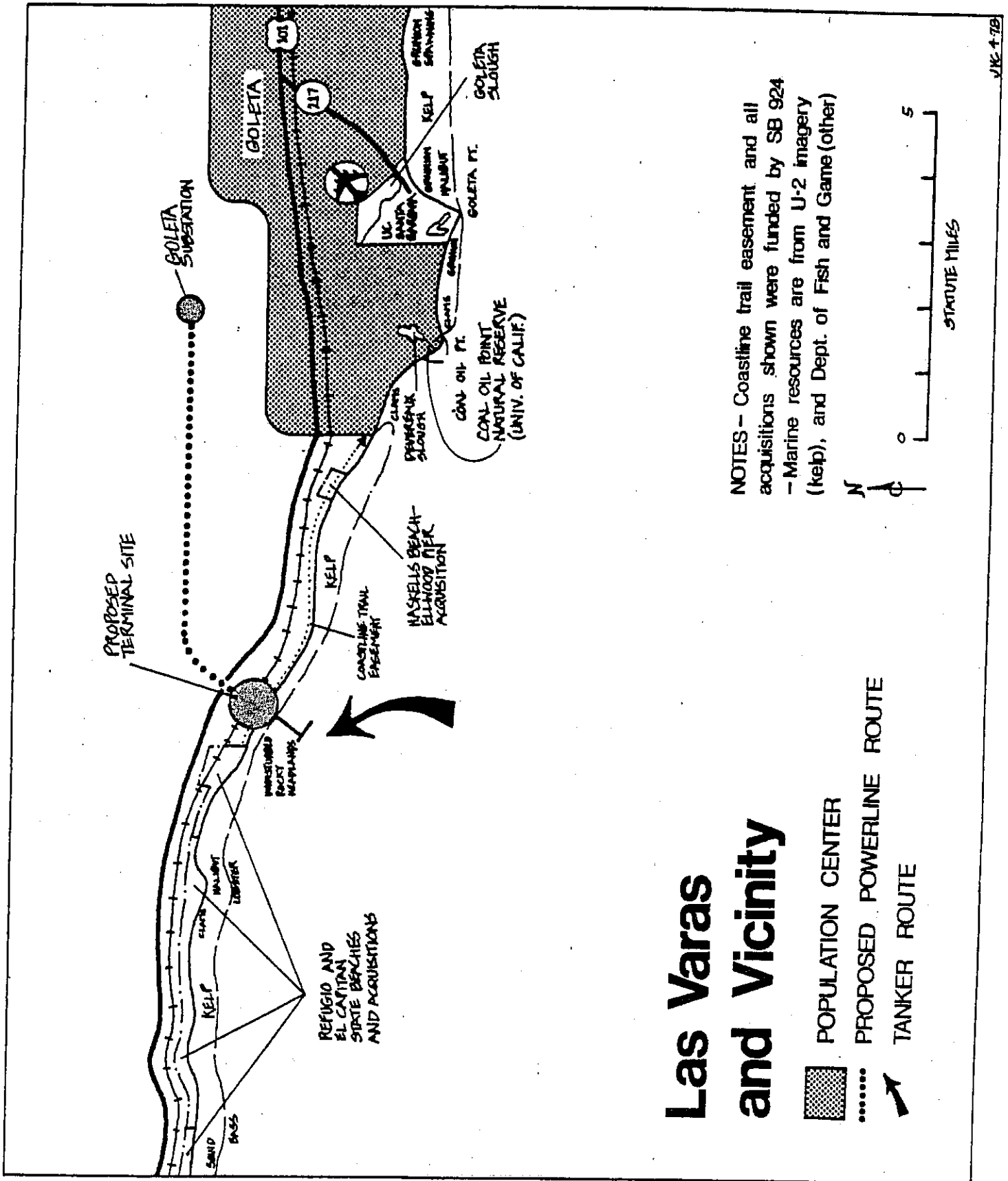
research projects on LNG risks. The Commission therefore urges the PUC and Department of Energy, if they approve a terminal, to develop stringent safety regulations and a monitoring program to ensure that LNG risks to people and property are minimized, regardless of the "remoteness" of the terminal location. In addition, the Commission urges the Coast Guard to institute a program to inspect the LNG vessels for structural integrity and other safety risks for the life of the vessel.

4. The Basis for the Site Ranking Is the Heavy Weighting of Coastal Act Policies on Recreation, Public Access, Protection of Natural Resources, and Minimizing Adverse Development Impacts. The LNG Terminal Act requires the Commission to base its site ranking on findings applying the policies, goals, and objectives of Chapter 3 of the Coastal Act. Most of these policies provide for the protection and enhancement of public recreation opportunities and public access to and along the coast, for the protection of valuable marine and wildlife resources, and for minimizing adverse impacts of coastal developments on public views and the character of coastal areas. The Commission has given greatest weight to these policies in ranking the sites. Less weight has been given to the Coastal Act policies providing for consideration of terminal cost and safety differences at the sites. Although the LNG Terminal Act restricts the number of permanent residents and workers in the terminal area, the Commission finds that visitors, campers, and travelers within four miles of an LNG terminal and, to a lesser extent, people and property beyond four miles may also be at risk from LNG accidents. Therefore the "remoteness" of the sites from transients, permanent populations, and nuclear power plants has been considered in the site ranking.

5. Seismic Safety Considerations.

a. Seismic Siting Criteria. In December the Commission published criteria for evaluating possible sites for an LNG terminal. The seismic criterion stated that no site would be retained for the ranking if it were on or within 50 feet of an active earthquake fault. Public comment emphasized that this standard was not conservative enough. Although Nuclear Regulatory Commission seismic criteria for nuclear power plant siting are not directly applicable to LNG terminals, for purposes of comparison, the NRC does not license nuclear power plants that lie upon or are in close proximity to "capable" earthquake faults. These are defined as those with movement within the last 35,000 years or multiple movements within 500,000 years. The NRC generally considers as not suitable sites located within five miles of a surface capable fault longer than 1,000 feet. Draft regulations of the Department of Transportation's Office of Pipeline Safety Operations would also prohibit LNG terminal siting near a capable fault.

b. Seismic Safety Considerations Remove LAS VARAS from the Ranking. The Commission authorized its geologic consultants to trench the Las Varas site (Figures 4 and 5) to investigate a questionable surface feature. The trenches at that site confirmed the presence of a small thrust fault that apparently has moved approximately three feet at some time within the past 30,000 to 50,000 years. LNG storage tanks and other critical components at a terminal would be in close proximity to this relatively youthful fault (Figure 5). There is a very good possibility of similar and related geologic features on the site. Because of the possibility of future surface faulting at this site, and in spite of the low probability of a failure, the Commission has removed Las Varas from further consideration as an LNG terminal site to minimize risks to persons and property. This action is consistent with the siting criteria published in December.



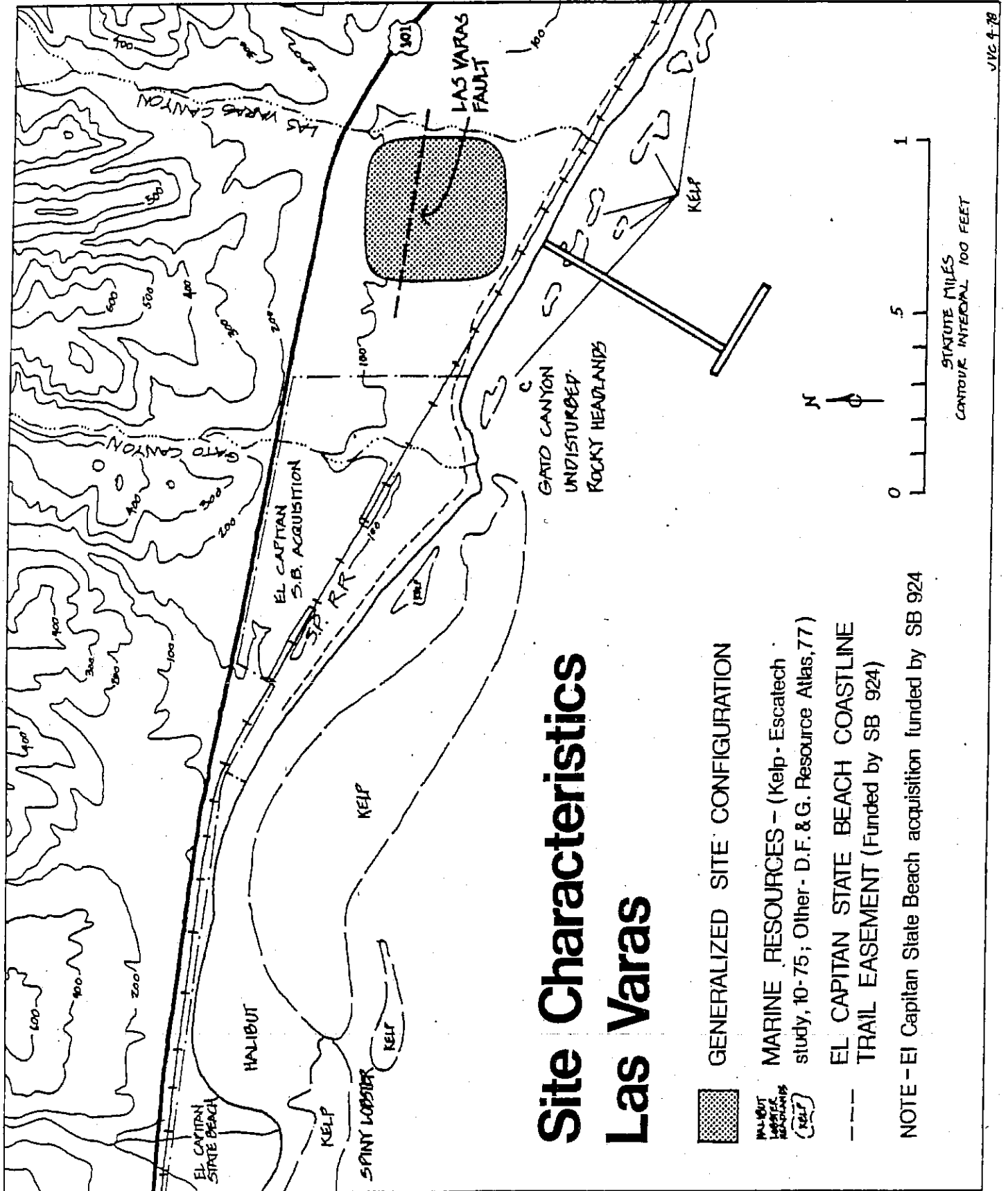


Figure 5

The removal of Las Varas from the ranking is done even though the Commission's own consultants believe that design features can minimize risks due to surface faulting. The Commission believes that it is not prudent to locate such a large and potentially hazardous industrial facility on a site with known recent faulting.

c. Little Cojo Must Be Ranked Despite Seismic Problems. Recent information presented by geologists employed by the Hollister Ranch, and confirmed by the Commission's consultants, indicates that the Little Cojo (Point Conception) site has a fault (Figure 11) similar to that found at Las Varas. Applying the same reasoning and caution which caused the Commission to remove Las Varas would also mean eliminating the Little Cojo site from further evaluation. However, the Liquefied Natural Gas Terminal Act of 1977 precludes that action. Since it is the applied-for site, it must be ranked by the Coastal Commission. If it were not for the requirements of the legislation, that specific site would no longer be considered.

Both the PUC and the federal Department of Energy (DOE) have requested Western LNG Terminal Associates to further evaluate the seismic hazards at the Little Cojo site. It is possible, after more evaluation, terminal design work, and possibly shifting the site away from the fault within the same siting area, that Western LNG Terminal Associates could convince the PUC and DOE that licensing a terminal at Little Cojo would be acceptable.

It is also possible that more detailed seismic evaluations, including trenching, at one of the other three sites, if approved, will discover small faults similar to those found at Las Varas and Little Cojo. If these common faults in California coastal areas are also discovered at other sites, and if there is an overriding need for an LNG terminal site, all the sites, including Las Varas and Little Cojo, should be reevaluated to select the one upon which design features can minimize the risks. However, authorization to construct an LNG terminal on a site with an active surface fault nearby would be a significant departure from currently accepted regulatory practice.

6. Adding Facilities to a Terminal. The Commission's maritime consultants indicate that if an approved terminal reaches the maximum gas delivery rate authorized under the LNG Terminal Act, 1.3 billion cubic feet per day, additions may be needed to the terminal to increase the reliability of LNG tanker berthing and unloading (see Staff Notes). Possible additions that might be considered would include a fourth LNG storage tank, second berth, or a breakwater to protect the berthing area. In this site ranking, the Commission is considering a breakwater only at the Rattlesnake Canyon site, and a breakwater at other sites, particularly Little Cojo, would lower the ranking of such site.

The three options for improving gas supply reliability that involve terminal additions are not part of any application. There is no clear State regulatory process for approving such additions after a permit is granted under the LNG Terminal Act of 1977. If proposals are made in the future to add facilities to a terminal, all alternatives and their degree of environmental damage should be evaluated. The Commission urges the legislature and the PUC to develop a review and approval process for terminal additions; and the Commission should have a major role in selecting an alternative and developing terms and conditions.

7. Horno Canyon on Camp Pendleton is Ranked First. The Commission ranks the Horno Canyon site on Camp Pendleton (Figures 6 and 7) first among the four sites because construction and operation of an LNG terminal there would have the least adverse effects on the objectives of Chapter 3 of the California Coastal Act of 1976. The basis for this ranking is that a Horno Canyon LNG terminal would have low adverse impacts on public access, recreation, and natural resources and would not be inconsistent with most of the development policies of the Act. It is ranked first despite statements from the Navy and Marine Corps that the site would not be available for an LNG terminal, because the military does not necessarily exercise final control over the use of federal property. Federal property is not subject to state authorized eminent domain proceedings. Consideration of national energy priorities and a federal LNG terminal siting policy to locate such terminals where they will be least damaging to the environment, however, could cause other officials in the executive branch, including the President, to make the land available.

The Commission recognizes that under both the federal Coastal Zone Management Act and the California Coastal Act the Commission does not regulate lands on the coast in federal ownership. However, the LNG Terminal Act of 1977 expressly states that the Commission shall study, evaluate, and rank "potential onshore sites for an LNG terminal" (Section 5611) and that "onshore" is defined as "any location on the mainland of California landward of the mean high tide line" (Section 5565). Thus the Act requires an evaluation of all potential sites regardless of site ownership, even though use of federal lands for a terminal would have to be a federal decision. Given the small number of feasible sites remaining after an evaluation of 82 sites, this has turned out to be a prudent legislative directive.

Public Access and Recreation. A Horno Canyon terminal would have more adverse impacts on coastal recreation and public access than a Rattlesnake Canyon or Little Cojo terminal and less adverse impacts than a terminal at Deer Canyon.

Public Access. The Horno Canyon site is owned and used by the U.S. Marines and is not open to the public. Visitors can reach it by walking south along the beach from San Onofre State Park, which extends to about a mile from the site, but Marine patrols prevent public use. Recommended conditions 1 and 18 would, at a minimum, preserve the existing public access in the area, and perhaps increase it.

Recreation. The terminal's 8700-foot long trestle would degrade the recreation experience for some visitors at San Onofre State Park, but the most heavily used area of the park, popular for surfing, is five miles from the site and is divided by the large San Onofre Nuclear Power Plant. Boating from Oceanside and San Clemente is popular in the area, and tanker operations could result in some restrictions on boating near the terminal. The Department of Parks and Recreation indicates that only a Rattlesnake Canyon terminal, of the other three sites, would cause less adverse recreation impacts than a Horno Canyon terminal. In fact, the Department did express hope that someday this last major block of undeveloped coastal property in Southern California, Camp Pendleton, might be a park (Exhibit 00502). Given the site's present use and lack of access, however, the Commission finds a Horno Canyon terminal would have a low adverse effect on public recreation opportunities if recommended conditions are imposed by the PUC.

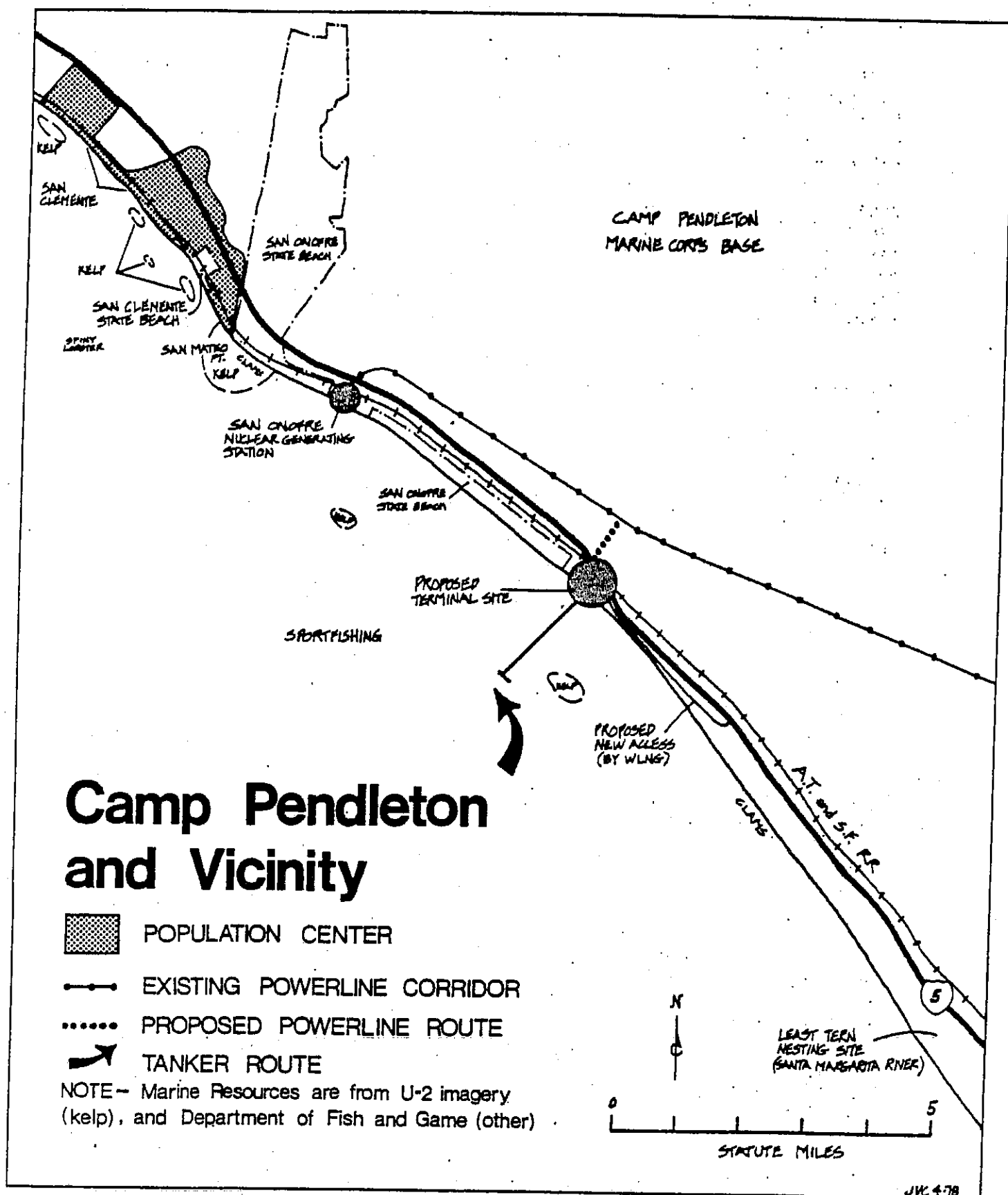


Figure 6

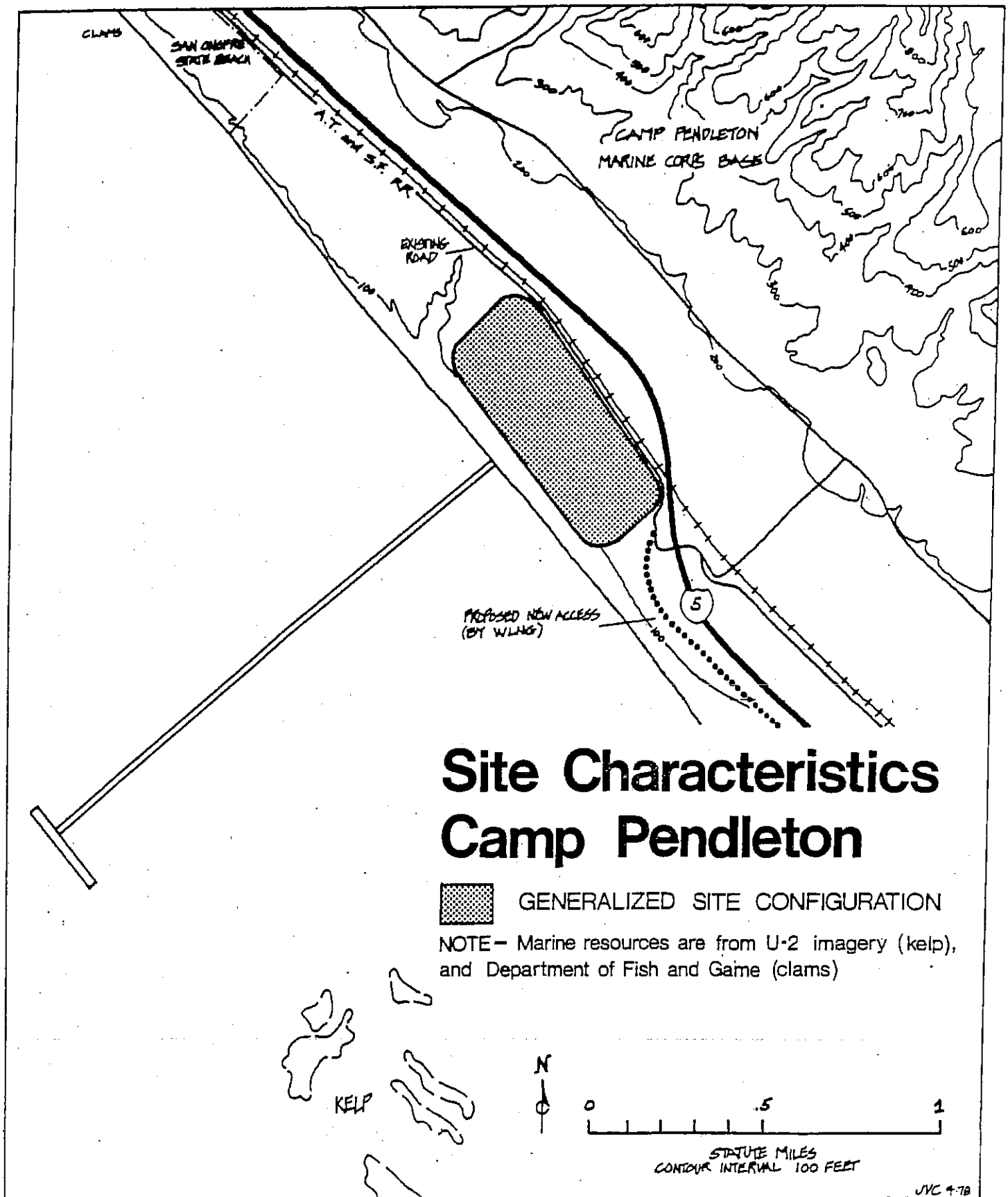


Figure 7

Marine Environment and Land Resources.

Marine Resources. A Horno Canyon LNG terminal would have the least adverse impacts on marine resources protected by the policies of Article 4, Chapter 3 of the Coastal Act. The lack of suitable offshore rock or reef bottom prevents the offshore area from supporting more than intermittent kelp beds of comparatively low importance. Although the area supports very good commercial and sport fisheries, most of the species which are fished are not dependent on nearshore features, such as Kelp beds or rocky reef areas, that would be affected by terminal construction and operation. The fishing catch per unit of effort is low. Therefore the Department of Fish and Game judged the adverse impacts on marine resources as less significant than at the other three sites (April 17, 1978 letter from Charles Fullerton to the Coastal Commission).

Land Resources. The onshore wildlife resources of the site, which consist of a natural coastal sage scrub community and are of low diversity and abundance, are common to the general area. Military activities, mainly vehicle travel over the site, have affected the scrub communities. The site is not presently inhabited by any rare or endangered species of animals or plants, although it is probably visited by the California brown pelican, an endangered species, and the white-tailed kite, a fully protected species. The area is of relatively low importance to marine bird and mammal populations, so the Department of Fish and Game has concluded that LNG facilities would have the least adverse impact on wildlife species of special concern than any other site.

Archaeological Resources. The State Historic Preservation Office indicates no cultural and archaeological resources are known to exist at the site (Exhibit 00774).

Land Use and Development Policies. The Camp Pendleton Marine Corps Base has helped to limit urban expansion into the largest remaining undeveloped coastal area in southern California. The Commission believes that open space is a desirable use of this 10½ miles coastline and its conclusions on the siting of an LNG terminal should not be viewed as encouraging other kinds of development. The requirements of the LNG Terminal Act could have the effect of limiting possible future development within four miles of the site. The 100-acre site constitutes less than .1% of the Camp Pendleton Marine Corps Base and is not used for military operations. Testimony by representatives of the U.S. Navy and Marine Corps indicates that a Horno Canyon LNG terminal would, however, conflict with amphibious military training exercises considered necessary to maintain national defense preparedness (see Staff Notes). The nearest beach at which amphibious landings take place is less than 2 miles south of the site, but the Navy indicates vessel maneuvers take place where the LNG terminal trestle would be located. In addition, the Marines operate airplane flight paths over the site. Therefore, if an LNG terminal is located at this Camp Pendleton site, vessel and aircraft maneuvering areas would probably have to be changed.

Public Services. The Horno Canyon site comes closest, given the population restrictions in the LNG Terminal Act, to meeting the coastal policy of locating new industrial development in areas of existing industrial facilities. The site is readily accessible by an existing highway and railroad, and public services, including emergency medical facilities, are nearby. Adequate electrical transmission lines are within a few thousand feet of the site.

Alteration of Natural Landforms. Little landform alteration would be required to prepare the fairly level site, although some minimal offsite disposal of dirt may be necessary.

Offshore construction would not require any reef removal or breakwater construction.

Public Views. The relatively undeveloped and open stretch of coast between the San Onofre Nuclear Power Plant and Oceanside provides a comparatively uninterrupted sweeping view of the ocean to the west and rolling hills to the east along heavily traveled Interstate 5. It provides visual relief from the highly developed Orange County and San Diego County coastal areas and, of the four sites, is viewed by the most people. Immediately adjacent to the southern boundary of the site is a scenic viewpoint on I5. A Horno Canyon terminal would intrude a major industrial facility in the middle of this stretch of coast. A terminal would be less visually incompatible with the imposition of condition 18, which requires partially undergrounded LNG storage tanks, but the 8,700-foot long trestle would be visible from much of the San Diego County coastal areas.

Weighing the different impacts on views to and along the coast at the different sites is complicated and subjective. While the view along Camp Pendleton's coastal terrace provides a sweeping vista for Interstate 5 drivers, the terrace itself is generally flat and not spectacular. By contrast, the view of the coastal terrace at Little Cojo is spectacular, with bays and curving bluffs along the shore, and ravines dropping to sandy beaches from the steep canyons of the Santa Ynez Mountains. However this Little Cojo view can be seen only by fortunate residents and visitors to the private Hollister and Bixby Ranches and those who can reach the offshore area by boat, while the Camp Pendleton view is seen by 60 to 80,000 drivers a day.

Remoteness. The risks to population concentrations associated with a Horno Canyon terminal seem roughly comparable to terminals at the other sites except at Little Cojo, the most distant site from urban areas. The nearest permanent population concentrations to Horno Canyon are at least ten miles away at Oceanside and San Clemente. Some Marine barracks may have to be relocated to meet population density standards within four miles of the site. As with the Rattlesnake Canyon site, and unlike the other two sites, a nuclear power plant is about five miles north of the site (see Staff Notes).

The Horno Canyon site provides the opportunity for LNG tanker traffic to travel outside the Santa Barbara Channel shipping lanes should the Coast Guard determine that such a route provides greater safety.

Cost. The Public Utilities Commission indicates that construction costs at Horno Canyon would be comparable to those at Little Cojo, which is currently estimated as costing about \$475.5 million. Terminal construction at both sites would cost about \$250-300 million less than at Rattlesnake and Deer Canyons. The Horno Canyon cost would be comparatively low because the site is on a level coastal terrace and no breakwater would be required.